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MANGANESE: A VITAL RAW MATERIAL

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A few hours in the Pittsburgh district cannot fail to impress the observer with the magnitude of the industrial development there. Veritable mountains of iron ore, from the Lake Superior Region, appear in the stock piles of the iron and steel mills. Large barges of coal from the upper Monongahela are pushed down that river or up the Ohio and Allegheny to the riverside industrial sites. Train loads of limestone follow the meandering valleys to the mighty blast furnaces that almost completely encircle the city. Thus, in seemingly inexhaustible quantities, are collected, from our own reserves, the three essential raw materials for the production of pig iron, and in a moment of excitement we may become over enthusiastic about our economic independence and our national self-sufficiency.

But pig iron is weak, easily broken, and especially susceptible to corrosion which is the great enemy of iron and steel. Therefore, before pig iron can be successfully utilized in the manufacture of machines, in the erection of tall buildings, in the construction of bridges, ships, or armaments—in fact in any use where durability, elasticity, or flexibility is required, it must be converted into steel. In this process a variety of little known and little appreciated minerals are of vital importance. Standing at the head of this list is manganese, a bluish gray, amorphous mineral, the high grade ores of which are strikingly deficient in this country.

USES OF MANGANESE

Small quantities of manganese are used in the manufacture of dry cell batteries, paints, dyes, and in other chemical industries, but it finds its greatest use in the iron and steel industry. It is probable that ninety-five percent of the world's production is consumed in this latter field. While only fourteen pounds of manganese are used in the production of a ton of steel, it is of vital importance because

it is the only material that has yet been discovered which can be used economically to de-oxidize and de-sulphurize this metal and thereby make it tough and durable. In this treatment, as little as one tenth of one percent of manganese added to steel will increase its tensile strength by about 1500 to 2000 pounds per square inch.

In the manufacture of steel, manganese is almost always added in the form of an alloy, such as spiegeleisen or ferromanganese. Low grade ores, ranging from ten to thirty-five percent manganese, are used in the manufacture of spiegeleisen while the ferromanganese is made from richer ores. Altho spiegeleisen may be substituted for part of the manganese requirement, it cannot be used to the exclusion of ferromanganese. Thus, to insure material for steel production there must be deposits of high grade manganese ore.

Because it is absolutely necessary in the preparation of steel for armaments and defense purposes as well as normal peacetime industrial development, every nation ranks manganese as one of the most essential materials. This mineral has frequently been termed the "barometer of international affairs." The plans of a nation may be inferred by the quantity of manganese that is being stored within its borders, for no nation will undertake the prosecution of a war without a goodly supply of this vital substance.

World Production

In 1938, the last year for which reliable statistics are available, eighty-five percent of the world's production of manganese came from the five countries of U.S.S.R., India, Union of South Africa, Gold Coast, and Brazil, in the order named. The remaining fifteen percent came from thirty-two other widely scattered countries where the ore is of low grade. In spite of the impending international crisis and the desire of many nations to develop reserves of manganese within their own countries by means of tariffs and subsidies, the production percentages in 1938 were but little different from the average for the eight-year period prior to that year (Fig. 1).

Manganese in the United States

Altho a map showing the distribution of minerals in the United States reveals that there are 216 locations in thirty-four states where manganese deposits are found, it is very misleading because the deposits are small and the ore is of very low quality. For more than twenty years the manganese producers here have insisted that

with proper tariff this country could become self-sufficient. However, even with a duty of one hundred percent, ad valorem, we annually import ninety-five percent of the manganese we use. Only under the stimulus of excessively high prices and urgent necessity has this country ever been able to produce as much as thirty-five percent of our local needs. It is, therefore, obvious that the present methods of extracting the mineral from our own low grade ores are impracticable.

Private companies have been collaborating with the United States Bureau of Mines in an attempt to find some new means of producing high quality manganese from our low grade ores. As a result of this intensive research, two methods have been found which seem applicable to commercial production. In 1938 it was discovered that manganese metal of high purity could be electrolytically recovered from ores which were heretofore considered worthless. Immediately a small plant was established at Knoxville, Tennessee, utilizing the local ores and the hydroelectric power of the T.V.A. If this plant proves to be a success, larger plants will surely follow. The second method discovered is the flotation process. While the actual method is complex, simply stated, it consists of grinding the ore to release the dirt and other impurities, washing it to remove the undesirable materials, and roasting the purified ores to remove excess moisture. This process is being used by the Montana manganese producers with a considerable degree of success. What effect these two processes will have on our future production of manganese is still a matter of speculation.

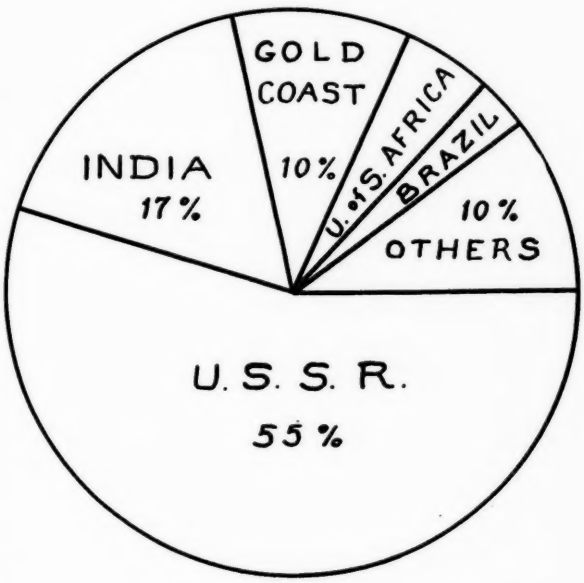

Fig. 1. Percent of the world's production of manganese. Average 1931-1938, inclusive.

It should not, however, be inferred that this country's steel industries are completely at the mercy of foreign producers of manganese. With the increasing complications in the international situation threatening to interrupt the steady flow of vital raw materials, Congress, in 1939, passed the Strategic Materials Act. This bill provided for the expenditure of $100,000,000 over a four year period for the establishment of reserve stocks of vital raw materials not readily available in this country. The quantity of manganese now stored in bonded warehouses in this country is estimated to be sufficient to completely supply our steel mills for a period of about two years. A few months ago, the Montana producers of manganese, where the new flotation process is being used, signed a contract to supply 80,000 tons of this mineral annually for the government's stock pile.* Montana is by far the greatest producer in the United States and is followed by Arkansas, Georgia, and Tennessee, in the order named.

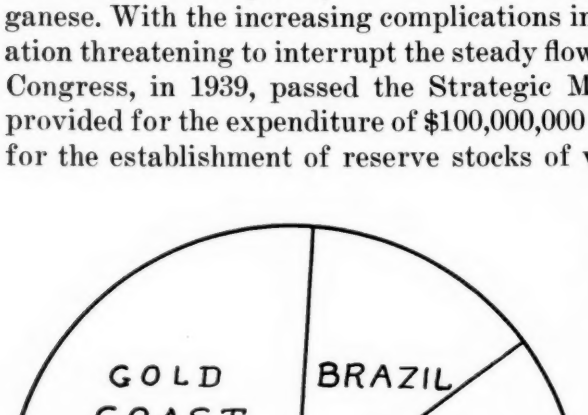

Fig. 2. Source of foreign ore used in the steel industry. Average 1935-1939, inclusive.

When sea lanes are not interrupted by war, the U.S.S.R. provides our greatest source of imported manganese. In spite of the unsettled international situation, the imports from this source are still very large. Other sources of manganese for our imports are Gold Coast of Africa, Cuba, India, and Brazil (Fig. 2).

THE U.S.S.R., THE WORLD'S GREATEST PRODUCER

In the U.S.S.R., the world's greatest producer of manganese, there are two major areas of production. The one from which Russian ores are exported, is near the village of Chiaturi, just south of

* This is about 12% of our normal annual consumption.

the Caucasus Mountains. The second area is adjacent to Nikopol, a Ukraine village on the Dneiper River. In 1937, approximately fifty-seven percent of the production of the U.S.S.R. came from the Chiaturi region, thirty-three percent from Nikopol, and the remaining ten percent from a great number of small workings.

The village of Chiaturi lies in the valley of the Kvrilli River, a tributary of the Rion. Here the streams have cut deep, steep-sided valleys in the mountain spurs. In many places the upland surfaces are one thousand feet above the valley floors. The black ore beds are well exposed near the top of these high cliffs and are six to seven feet in thickness. Production has been limited to seven ridges or spurs that extend into the Kvrilli Valley near Chiaturi. Natural conditions are conducive to the production of manganese here, since, (1) the beds are of sufficient thickness to permit easy removal of the ore, and (2) the enclosing rock is so firm that very little timber is needed. Under such conditions the Georgian peasants, who were without capital or mining knowledge, early began the extraction of the ore by very primitive and inefficient methods. Picks, hand shovels, and wheelbarrows or baskets, for the removal of the ore, were the only equipment needed. Operations only penetrated the outer rim of the hills and even here not more than two-thirds of the ore was recovered. As a result, the more easily mined ores have been exhausted and in the last two or three years new equipment for the development of underground mining has had to be installed. Also, two plants for the concentration of the ores are being built at Chiaturi.

The distance from the mines to the village varies from one to four miles and the roads and narrow trails zigzag down the precipitous slopes to the valley floor. In wet weather these trails are especially hazardous and the charge for delivering the ore depends upon the condition of the roads. Pack animals and primitive two-wheeled carts, locally known as "arbas," are used to bring the ore to the village. Here it is loaded onto a narrow-gauge railroad that follows the Kvrilli Valley down to Sharopan, twenty-one miles away. At Sharopan the ore is re-loaded into cars on a wide-gauge railroad that connects Poti and Batum, on the Black Sea, with Baku, on the Caspian. Poti, located ninety miles southwest from Chiaturi, is the chief port of export altho Batum, about thirty-six miles farther away, is a close second.

Altho the deposits here are extensive and the ore has a high mineral content, there are certain physical characteristics which are

definite handicaps. Much of the ore is quite soft and it grinds to a fine powder during the preparation for market. Furthermore, it is easily broken and seldom are large pieces of ore obtained at the mines. Hence, the loss of ore during shipment is great.

The Nikopol deposits are becoming increasingly important as the U.S.S.R. increases its industrial development, because this deposit supplies the bulk of the manganese for domestic use. The production here has been developed by a German firm and is on a more systematic basis than at Chiaturi. The Nikopol mines are connected with the Dnieprostroy hydroelectric power works and electric elevators bring the ore to the surface after it has been mined with the aid of modern electrical machinery. It is entirely probable that this deposit will soon be the most important producing region of the U.S.S.R.

Germany is the principal market for Russian manganese, normally taking approximately forty percent of the export. The United States and France have been the next best customers, taking about twenty and fifteen percents, respectively.

INDIAN PRODUCTION

Manganese ores are widely distributed thruout peninsular India. However, seventy-five percent of the production is restricted to the Central Provinces, located at the northern end of the Deccan Plateau. Because of the greater resistance of the ore to erosion, the deposits stand out as low hills or ridges. Open pits on the hillsides mark the sites of mine operations thruout the Central Provinces. The ore is high grade and manganese ranks third in value among the minerals of India. Almost the entire output is exported. Vizagapatam, on the Bay of Bengal, is the chief port for the shipment of the ore from India. A small quantity of low grade ore is mined in the western part of the peninsula. Western Europe, the United States, and Japan receive the greater part of the Indian export.

PRODUCTION IN AFRICA

At the close of the World War in 1918, Captain T. L. H. Shone, along with many other British soldiers, took up claims near Postmasburg in the Union of South Africa. Four years later, while prospecting on his small farm, Captain Shone recognized the possibilities of developing a manganese mining industry here. He soon discovered that the deposits of high grade ore were widespread and large quantities could be obtained by merely picking up stones on

the surface. But the next problem was to get financial backing for the production and marketing of the mineral. There were several handicaps that had to be overcome. In the first place, these deposits were sixty-seven miles from the nearest railroad. As tho this were not enough of a handicap, he soon found that a curious law in South Africa provides that only the government may own and operate a railroad which is over two miles in length. As in many other countries, the government had commitments for the revenue for several years in advance. However, Captain Shone interested a group of financiers who incorporated as the Union Manganese Mines and Minerals, Limited. This company offered to lend the government the money for the construction of a railroad from Postmasburg to Koopman's Junction where it would join the main line between Kimberley and Capetown. The offer was accepted and this line provides the present outlet for the ore mined around Postmasburg.

Recent surveys indicate that these deposits of manganese extend, unbroken, for a distance of forty-seven miles and the reserves are estimated at 1,000,000,000 tons of ore which averages about fifty percent metal. All of this can be mined by open pit methods. Mining is done by black labor and the mineral is exported from the city of Durban. Altho freight costs from Durban to the United States are less than from either India or Russia, very little is sold in the United States. Interestingly enough, in 1939, the year the present war started, the greatest consumer of South African manganese was Germany.

The largest production of African manganese is found in Gold Coast. Altho two known deposits exist, production has been limited to one open pit mine near Tarkwa. Normally, between 400,000 and 500,000 tons of ore are exported annually from this mine. Modern power shovels are used in the mining operations and in 1936 a sintering plant was erected and put into operation to reduce the moisture content of the ore. The roasted ore is shipped by rail to the nearby port of Takoradi from which it is exported to the United States and Great Britain. As yet, the deposit in the valley of the Black Volta has not been developed.

Small quantities of manganese are mined in the Sinai Peninsula by British companies and in the Sous area of Morocco by the French.

MANGANESE IN BRAZIL

The largest known deposit of manganese in the Western Hemisphere is in Brazil and for many years this substance has been the

leading mineral export of that country. However, it must be remembered that the mineral trade of Brazil is small and the value of manganese is less than one percent of the total value of exports. Altho deposits are known to be present in Matto Grosso, Bahia, and Minas Geraes, the only important producing area is in Minas Geraes. Here the mines are located along the Central Railway of Brazil and are concentrated about two centers, (1) near Lafayette and (2) the Miguel-Burnier district. These two areas are less than twenty miles apart and are about two hundred seventy-five miles from Rio de Janeiro, the major export center. Both open pit and shaft mines are found here. The largest mine in Brazil is the Morro da Mina (Hill of the Mine). Shortly after the construction of the railway thru Lafayette, manganese was discovered in this hill and the entire hill was sold for the ridiculously low price of $6,000. A company was soon formed and began operations. Altho production was not great, it was discovered that an unusually large body of ore was present. This attracted the attention of American business men and in 1920 a subsidiary of the United States Steel Company paid $4,000,000 for this same hill.

Mining operations in Minas Geraes have the advantage of being near to the Central Railway of Brazil which transports the ore to Rio de Janeiro. However, the long haul is a disadvantage. The shipment of ore from Minas Geraes was almost completely stopped during the months of September and October of 1939 because of lack of coal which curtailed train schedules. European coal had been used but the outbreak of hostilities in September of that year suddenly reduced the supply. However, new sources of coal have been found and shipments are again back to normal. The entire output of the Morro da Mina mine goes to Baltimore and Philadelphia for distribution in the United States.

The first manganese deposit to be worked in Brazil was in the State of Bahia, near the city of Nazareth. Because of poor harbor facilities along the coast of Bahia, this region is producing very little ore at present. Likewise, while large deposits are found in Matto Grosso, because they are isolated, they are but little worked.

CUBAN PRODUCTION

Most of the Cuban production of manganese is under the control of an American corporation and exports of this mineral to the United States have increased materially in the last few years. In 1938 over one-fourth of our imports of manganese came from Cuba

altho the amount has declined somewhat since that year. In 1935, when the tariff on Brazilian manganese was reduced about fifty percent, it appeared that the Cuban industry had been killed. The mines in Cuba ceased operations, since they could not meet the competition from Brazil without the aid of a differential tariff. Company scientists, working with the United States Bureau of Mines, began to experiment in an attempt to find a method whereby the low grade Cuban ores could be concentrated so that they could successfully compete with ore from more distant sources. As a result of these experiments, the flotation process was developed, which has since been adapted to manganese production in the United States. Since Cuba is now able to provide concentrated ore, the production for the Amerian market has been greatly increased. Almost the entire output is from the Province of Oriente, near Santiago.

THE PHILIPPINES—A NEW SOURCE

The production of manganese ore in the Philippines is still in its infancy and many adjustments are still being made. Altho the ore is found from one end of the islands to the other, it occurs in small lenses and the actual quantity is very difficult to estimate. At present the mining is concentrated in three major centers, (1) on the Island of Luzon near Burgos, about one hundred twenty-five miles northwest of Manila, (2) Busuanga Island, approximately two hundred miles southwest of Manila, and (3) the small island of Siquijor which lies between Mindanao and Negros islands. Minor differences occur in the production of the ore from place to place but the same general conditions are found thruout this area.

Mining is carried on by the open pit method and the "pakiao" or task system of production is commonly accepted. Under this system the workers have no fixed hours but work when they care to. All tools, such as picks, shovels, and crowbars, are supplied by the company. The workers agree to provide a definite amount of ore at specified times and as long as this is done, the manager does not bother them. The ore recovered from the shallow pits is hand screened with a bamboo screen, the openings of which are about one half inch square. Any material that falls thru this screen goes to waste, while the larger pieces are washed and carried to the stock piles along the roadside in baskets containing about one hundred twenty-five pounds each.

This system of production is far from being economical, since many small pieces of high grade ore are left behind. Furthermore,

there is much clay and sand incorporated in the larger pieces of ore which could be removed by crushing and more thoroly washing it. However, since the water for washing the ore must be carried by hand, usually in emptied oil cans, so commonly in use in the Orient, it is easy to understand why more thoro washing does not take place. The ore is hauled from the roadside stock piles to the ports by motor trucks.

There are three definite factors which favor the expansion of the manganese industry in the Philippines. (1) The ore is easily mined and only the simplest tools are needed. The removal of the overburden in some pits, however, is becoming increasingly difficult. (2) Transportation costs from the mine to the port are relatively low because the ore is mined near the coast and there is an abundance of easily accessible road-building materials available. (3) Labor is cheap, altho inefficient. The wage scale is about one-tenth that of the United States.

Offsetting these advantages there are several difficulties to be faced. (1) The small and discontinuous lenses of ore do not favor large scale mechanized development. (2) There is a very high moisture content in the ore, often as much as ten percent of its weight. (3) There is a lack of engineers who have had experience in mining and beneficiation of manganese. Of thirty-three manganese companies, only three have officers who have the vaguest idea of what is to be done. (4) Typhoons disrupt production and shipment of the ore. (5) Delays in getting leases are very common, due to the fact that it is difficult to establish definite ownership of the land. Even after the lease is obtained there are frequent law suits filed by those attempting to claim ownership. (6) Landowners frequently ask exorbitant royalties, amounting to as much as twenty-five percent of the gross receipts. The way in which these problems are solved will largely determine the importance of the Philippines as a producer of manganese.

Prior to the opening of the war in 1939, Japan was the largest consumer of the manganese from the Philippines. One of the major companies, The Philippine Nippon Mining Company, is under Japanese control "altho it has a dummy Filipino board."* However, when hostilities broke out in Europe and the manganese market improved, Japan began to have financial difficulties which

* Ralph Keeler, The Philippines—A New Source of Manganese, *Engineering and Mining Journal*, May, 1938, pp. 29-32 (p. 30).

made foreign exchange hard to get. The scarcity of freighters has not helped Nippon in controlling the market of Philippine manganese. Since 1939 most of the Philippine manganese has gone to the United States.

It is easy to understand Japan's interest in Philippine manganese, since Japan annually consumes about 200,000 tons of this mineral and produces but 50,000 to 60,000 tons itself. Imports are obtained from India, British Malaya, and French Indo-China. India is the chief source. It is, therefore, only natural for Japan to seek deposits nearer home.

CONCLUSION

Altho the United States imported ninety-five percent of the manganese used by the iron and steel industries here in 1939, the development of the flotation process for the beneficiation of low grade ore will undoubtedly make this country less dependent upon imported ore. It may even make us completely self-sufficient. Time alone will tell this. The present emphasis upon Inter-American cooperation will doubtless lead to further development of manganese mining in Cuba and Brazil with a shift in our trade from the U.S.S.R. and India to Latin America. British colonies will undoubtedly continue to supply the mother country with the required manganese. Japan's action in attempting to dominate the Pacific and Southeastern Asia is due, in a measure at least, to its desire to obtain and control more deposits of this vital raw material, manganese.

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CONSERVATION IN THE SCHOOLS OF NEBRASKA*

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The word "conservation" has probably been mentioned more times in the United States in the last ten years than in the preceding one hundred and forty years of our national history. Widespread unemployment and social distress in many regions have awakened the American people to the need of taking stock of their national resources. We have discovered with a shock that our enormous reserves of coal, petroleum, and iron ore are not limitless, and that they are being used up at a rate which has already brought exhaustion or declining returns to many districts. We have been even more profoundly disturbed by the depletion of our forests which is forcing us to depend more and more on Canada for our paper pulp and lumber. Some of our finest prairies have become "dust bowls" and the stalwart pioneers who homesteaded on them emigrant "Oakies" on the public relief roll. For a time the widespread destruction of wild life by unrestrained so-called sportsmen threatened to extinguish many of our favorite species of game animals, birds, and fish. When it finally became apparent that even our once-thought inexhaustible resources of water and soil were diminishing in both quality and quantity, the national government felt compelled to take drastic action. National, state, and local conservation committees have been established to do something about the problem of our wasted and wasting natural resources. Field workers, statisticians, land-planning experts, lecturers, writers and editors are combining their efforts and have begun to get results. The nation is at last becoming conservation conscious.

What part are the public schools of the nation playing in the broad program of education for conservation? It was with this question in mind that I undertook this modest study of the conservation movement in Nebraska and its relation to the public schools of the state. It should be of some interest to teachers of geography to see just where conservation fits into the general program of education in the primary and secondary schools of the central Great Plains.

* A paper presented at the annual meeting of the National Council of Geography Teachers, at Baton Rouge, Louisiana, December 27, 1940.

THE MEANING OF CONSERVATION IN NEBRASKA

In Nebraska the problem of conservation is principally one of maintaining the more permanent resources of soil and water, but practically all phases of conservation are represented to a greater or lesser degree within the state. Even the conservation of mineral fuels has entered the picture, for within the past year more than thirty producing oil wells have been developed in Richardson County alone, and scores more may be expected to be drilled during the spring and summer of 1941.*

For the purpose of my study, I divided the conservation of natural resources into five separate aspects: (1) conservation of natural vegetation—trees, grass, and range pastures; (2) conservation of wild life—game animals, birds, and fish; (3) conservation of soil, involving terracing and contour farming, gully control, the planting of cover crops and legumes, crop rotation, and the use of commercial fertilizers; (4) water conservation, including flood prevention, the storing of run-off water, urban water supply, the construction of farm ponds, gravity irrigation, pump irrigation, and the maintenance of the water table; and (5) the conservation of mineral resources—rock, gravel, sand, and clay, ferrous and non-ferrous metallic ores, and the mineral fuels. Special agencies are now at work in the state to encourage the conservation of most of these basic resources.

NATURAL VEGETATION

About thirty years ago, a state conservation committee was organized under the leadership of Professor C. E. Bessey, then Chairman of the Department of Botany at the University of Nebraska, and Dr. George E. Condra, present head of the Conservation and Survey Division at the University. It was thru the untiring and insistent efforts of Professor Bessey that the Halsey National Forest was established, one of two national forests in the state, both in the Sand Hills region. These two small national forests have amply demonstrated that, given proper care, trees can be grown successfully in this portion of the Great Plains and used for firewood, fenceposts, windbreaks, and home beautification. The Great Plains report of the National Resources Board advocated the reëstablishment of the prairie cover on some of the plowed land in the western part of the state, and the ecological studies con-

* About 45 wells were producing in July, 1941.

ducted by the Department of Botany of the state university, under the direction of Professor J. E. Weaver, have done much to select the proper grasses and the best methods of seeding. The national government, quite aside from the spectacular Shelterbelt Project, has helped hundreds of farmers over the state to start farm woodlots, and has made a careful study of prairie readjustment. Tree planting activities in Nebraska are mainly in the hands of the federal government, assisted by three state agencies, the Forestry Department of the Conservation and Survey Division, the Forest Extension Service of the College of Agriculture, at Lincoln, and the Nebraska Game, Forestation, and Parks Commission. Besides these, the state Highway Department and various local agencies have shown an interest in landscaping roads and developing parks in the state.

WILDLIFE

Wildlife conservation is almost entirely regulated by state agencies, particularly by the state game laws and the Nebraska Game, Forestation, and Parks Commission, cooperating with the Biological Survey of the Conservation and Survey Division. The Biological Survey has made careful studies of the wildlife habits of fish, prairie chickens, grouse, and ducks, with a view to perpetuating a satisfactory habitat. State fish hatcheries near Gretna in Cass County, at Valentine in Cherry County, and near Benkleman in Dundy County help replenish the stock of fish in the streams and lakes of the state. The state game preserves on Niobrara Island in northern Knox County and on Wildcat Range south of Scottsbluff help to protect some of the larger native animals of the state, such as buffalo, elk, and deer, while the Valentine Lakes Refuge has been established to assure unmolested breeding places for waterfowl. An investigation is being made of the feasibility of impounding the waters of small streams and thereby controlling lake levels on bird-refuge lakes in the western Sand Hills region. Nearly a hundred farms in the state are cooperating in the hatching of Chinese pheasants, now one of our most popular game birds.

SOIL

Soil conservation in Nebraska consists primarily of preventing the wasting of the top soil by stream and wind erosion and secondarily of avoiding the depletion of the soil by poor cropping practices. In the corn-growing sections of the state, soil erosion and

declining fertility can be at least partially conquered by including legume and grass crops in the rotation scheme, by plowing under stalk and stubble waste, and applying barnyard manure. The decrease in the number of livestock and, consequently, in the amount of available manure in some sections of the state, and the tendency on the part of some short-term renters to plant corn too many times in succession on the same field have been unfavorable results of the depression and recurrent droughts of the past ten years.

In some sections of Nebraska, as on the Platte River bottoms, on the young loess plains between the Platte and the Republican drainages, and in the Sand Hills region, the prevention of soil erosion is not a problem. Elsewhere, particularly in the dissected till plain of the southeast, and the loess hills of the northeast and the south, soil erosion is a major challenge to all who are interested in maintaining a permanent agricultural population. For thirty years the Nebraska College of Agriculture and the Conservation and Survey Division of the state university have been working on a soil and water saving program for the state, but the cooperation of the Federal Soil Conservation Service set up under the present administration has made it possible for considerable expansion of their work.

To coordinate the work of these agencies, the state legislature has created a state Soil Conservation Committee. Two demonstration projects, near Albion, in Boone County, and near Syracuse, in Otoe County, several CCC camps, and a number of recently organized soil conservation districts have been set up and are now functioning.* The complete program of soil conservation in the state includes the following: gully control, contour farming, strip cropping, terracing, systematic crop rotation, the planting of winter cover crops, pasture and range land management, construction of farm ponds and reservoirs, planting shrubs and trees for windbreak and erosion control, and protection of woodlands and grasslands from fires and careless use. The county agents—and all except five of Nebraska's ninety-three counties now have county agents—assist in the conservation program in both its practical and educational aspects.

WATER RESOURCES

The conservation of water resources in Nebraska is the concern of several local, state, inter-state, and national organizations. Much

*Since this article was written federal support of the project in Boone County has been withheld.

still remains to be done, and in some phases of the work the preliminary exploration of river flow, artesian wells, and subterranean waters is still incomplete. The State Geological Society and the Conservation and Survey Division, in cooperation with the Nebraska Well Drillers Association, have made available most of the facts concerning water and water supply, but it remains for the various agencies which control the wise use of the water resources to formulate a satisfactory conservation program.

The Nebraska state constitution provides for the allotment of water for domestic, agricultural, and industrial purposes, but there are still many open legal questions. As an example, the present federal statute which forbids the diversion of water over the watershed from one drainage basin into another is delaying the irrigation of some 200,000 acres of potentially irrigable land in Phelps, Kearney, and Adams counties. Irrigation or subirrigation is now available to about 2,200,000 acres, or four percent of the total area of the state, and this area is being extended each year by new flood irrigation and pumping projects. Within the last ten years the federal government has appropriated nearly $75,000,000 for hydro-electric and irrigation projects in Nebraska, bringing cheaper power and light to municipalities and extending irrigation water and electricity to many rural communities not previously served. Army engineers are now tackling the problem of preventing the recurrence of flood disasters such as the one which struck the Republican Valley in the spring of 1935, causing the loss of 100 lives and property damage amounting to many millions of dollars. A bill was introduced at the last session of the state legislature which would have given the state the right to control all underground water resources. Stabilizing the water table and controlling the flow of artesian waters are pressing problems in some areas if a continued water supply is to be assured.

MINERAL RESOURCES

The conservation of rock and mineral wealth in Nebraska is not as yet a pressing problem. Sand and gravel, which account for an industry worth $1,500,000 a year, are available in an almost unlimited amount. The same might be said for the clay used in brick and tile manufacture, and the limestone which goes into road materials and the cement industry. Commercial petroleum production began in Nebraska only a few months ago, and in this industry

the problem of finding an adequate outlet for the product is still more pressing than the problem of conservation. The second oil refinery in the southeastern corner of the state is now in process of construction.

EDUCATION FOR CONSERVATION

The conservation movement has an educational phase as well as a practical phase, and the two are closely related. If conservation of our natural resources is a worthy goal of democratic government, conservation practices must not be left to depend solely on legal compulsion. They must be ground into our everyday habits of thought until the need of passing on the best possible world to future generations is an accepted attitude on the part of the whole populace.

Most of the conservation agencies I have mentioned, and also the Nebraska State Planning Board* and various other state offices, publish books, pamphlets, and articles on their work to acquaint the public with what they are doing. Radio talks on conservation subjects are numerous, and competent lecturers are available for community and school programs at little or no cost. Many organizations have prepared slides and films which may be rented for the payment of postage or postage plus a small fee to cover depreciation. County agents and technicians of the Soil Conservation Service are nearly always willing and able to cooperate in educational projects.

THE POSITION OF CONSERVATION IN THE PUBLIC SCHOOLS

Are the public schools making use of their opportunities for teaching the conservation of natural resources? In an attempt to answer this problem, questionnaires were sent to the superintendents of fifty public schools of all sizes and in all parts of the state. In a letter accompanying the questionnaire, I outlined in some detail under the five topics mentioned above the points which might be considered as conservation. Approximately thirty replies were received. I should like to review briefly my questions and the replies of these school men.

1. In what branches of the curriculum in your school are any phases of conservation included? Which of the subjects mentioned in the letter are dealt with in these courses?

* Following a recommendation of Governor Griswold, a bill was passed by the state legislature early in 1941 abolishing the Nebraska State Planning Board.

I did not discover a single course in conservation as such, altho some conservation is taught incidentally in many branches of elementary and secondary work. Conservation of trees and grass, wild animals, and birds is given some attention in the primary grades, and in the high school the following courses were mentioned as giving some attention to conservation: Vocational Agriculture, Agricultural Problems, Problems of American Democracy, Rural Sociology, Economic Geography, Geography of Nebraska, Social Science, American History, Civics, Economics, Home Economics, General Science, Biology, Chemistry, and Physics. Vocational Agriculture and Geography of Nebraska classes apparently go most thoroly into the subject.

2. How much time is devoted to conservation in these courses?

This question was a rather difficult one to answer, and several superintendents avoided it but many others stated that from one week to six weeks was spent each year by each class on units related to conservation.

3. Do any classes take field trips to observe conservation projects and practices? What grades? What do they visit? Is the teacher or a conservation expert in charge of observation? How many such trips are taken during the year?

Some field trips to conservation projects are taken by elementary pupils beginning with the fourth grade, but in most school systems in Nebraska field trips begin with the lower high school groups. Out of the schools reporting, less than twenty per cent indicated that no field trips were taken, and these were mostly small school systems. Erosion prevention and tree planting projects were the most common objectives of conservation field trips, but a great variety of other visits were made: to national forests, irrigation projects, flood control projects, wells, dams, wildlife sanctuaries, fish hatcheries, farmsteads, and conservation agency offices. Less than one-third of the schools consulted made use of county agents or other conservation experts in planning their field trips. From two to six trips a year in each school are arranged to visit conservation projects. Vocational agriculture classes take many more field trips than any other single group.

4. Have you had any films on conservation this year? What were the titles? Where did you get them?

About two-thirds of the schools reporting said they had had one or more films on conservation during the year, and most of the

remainder said they had none because the school did not own a projector. In a few cases, schools without projectors had films anyway because they were shown by Department of Agriculture or University of Nebraska men who brought their own films, screen, and projector. Erosion prevention, river development, and tree planting projects were the favorite subjects. Some films were secured from local conservation offices, but more often they were ordered from outside sources. The State Soil Conservation Service office provided some films, as did the State Game, Forestation, and Parks Commission. Three schools reported having secured films from the United States Department of Agriculture, two from a private supply house in Denver, and one from the University of Missouri. Unlike Missouri, Minnesota, and many other states, the University of Nebraska has no film rental system at the present time, altho there is a probability that some such plan will be instituted within the next year or two. Only one high school reported owning its own movie films on conservation. Generally most Nebraska public schools still consider movie films too expensive to attempt buying their own.

5. Does the teaching of conservation in your school seem to have any carry-over outside of the classroom? In what way?

Two superintendents said they could see no indication that the teaching of conservation had a carry-over value outside the school. Three or four others were uncertain. Most of those who answered this question, however, said there was considerable carry-over, especially on the part of vocational agriculture and home economics students, who carry home ideas and begin themselves, or persuade their parents, to begin farm betterment practices at once. Some rather interesting responses suggested a carry-over in a heightened respect for game laws and attitudes of curiosity and concern with regard to water rights and conservation legislation. One superintendent, well schooled in the rigid principles of pedagogy, replied simply that, "All good teaching has a carry-over."

6. Do you think it would be advisable to have a course in the conservation of natural resources included in your curriculum? Why, or why not?

My most discouraging reply to this question was, "No! We have too much in the curriculum now." Eight superintendents replied with a qualified "Yes," but about two-thirds of the total number who replied said they believed it could be satisfactorily correlated with other courses, and thus one might avoid adding a new

subject to the curriculum. Most of those who objected feared there would be too much overlapping with courses already taught and suggested that conservation would have a larger audience if retained in its present position, that is, parcelled out among several courses taught over a period of years. A superintendent in a city of 9,000 wrote approximately this, "No, conservation should be part of all courses—a way of thinking and acting in the whole school, a definitely inculcated attitude, a phase of community and school coordination." With such an attitude in the minds of all school administrators in the state and nation carried over into actual classroom teaching, there would be little need for specialized work in the conservation of natural resources in our public schools.

CONCLUSIONS

To sum up, conservation in Nebraska is primarily concerned with long-range, permanent, or replaceable resources, and because of that and the late settlement of the state, conservation teaching has been somewhat retarded. The economic depression, floods, drought, and declining yields, however, have reduced the amount of agricultural income and forced attention on conservation practices. National, state, and local agencies are now at work, developing both the immediately practical and the long-range educational phases of the subject. The public schools have recognized the significance of the conservation movement and are cooperating, if often in a rather haphazard fashion, with its program. Public school teachers need some specialized training in conservation if they are to teach it satisfactorily either as a separate subject or as a part of other academic fields.

School administrators disagree as to the advisability of giving conservation a separate status in the elementary and high school curriculum, but apparently a majority of them in Nebraska are against it. If all phases of conservation can be adequately covered within the limits of other school subjects, it is perhaps advisable to keep it there. Geographers can help materially in suggesting revisions of state courses of study and high school curricula content so as to make them include conservation in its broadest and fullest sense. The conservation of natural resources is still not so much a definite body of subject matter as it is an attitude toward the wise use of the world's wealth, wealth which in the long run belongs to all races of all countries thruout all generations.

PANEL DISCUSSIONS FOSTER SUSTAINED GROUP ATTENTION

CLARE SYMONDS
Senior High School, Quincy, Illinois

The so-called "panel" discussion has, I believe, a very real place in class-room methods. It contributes effectively to the mastery of subject matter and consequently to a higher level of attention. By its very nature, the panel discussion promotes sustained group attention—there is a stimulus in group endeavor.

Furthermore, not only does the pupil gain skill in oral expression in the panel discussion, but also he acquires skill in rapid, clear thinking. Best of all, perhaps, this type of discussion encourages exactness of expression and fosters an attitude of courtesy and open-mindedness toward the opinions of others.

CAREFUL PLANNING NECESSARY

Lest I seem to claim too much for the panel discussion, I hasten to say that these desirable outcomes are attained only thru careful planning on the part of the teacher. Even tho it is the most *natural* type of class activity, a worthwhile discussion will not be likely to come about "naturally."

Furthermore, success may be jeopardized by some inexplicable cause. To illustrate: Last semester, a class of thirty-seven staged six "panel" discussions, each of which turned out to be a "question and answer" or a "question and no answer" recitation—the questions almost invariably being selected for their "difficulty." The panel members, chosen by the class, were aided in selecting the topic to be discussed and each time carefully coached on procedure, to no avail. If the chairman desisted from making the discussion a "question bee," some member of the panel came armed with questions and usurped the chairman's place as the leader of the group. To be sure, some questions should be included in a panel discussion, but the questions should serve to stimulate the *flow* of "conversation." In these question bees, there was none of the spontaneous give-and-take which characterizes conversation upon a topic about which the members of a group know something or at least have an opinion.

WRITTEN INSTRUCTIONS HELPFUL

Thinking over the possible reasons for the failure of this class to carry on a panel discussion, I came to the conclusion that pupils of just average mental ability need something more tangible than oral instructions for any activity, and perhaps the more able pupils would also profit by a device designed to benefit their weaker classmates. It was during the latter part of the semester, too late to help the class mentioned above, that I conceived the idea of providing each pupil with complete detailed instructions and suggestions for panel discussions, in a somewhat permanent form.

To this end bulletins were prepared and distributed in all classes at the end of the second week of this semester. At the same time suggested topics with bibliographies were also distributed. During the following week the beginning classes, each numbering nearly fifty, had some interesting panel discussions. The topics were chosen from their first unit of work, so that each member of the class group would have a fairly adequate background for intelligent participation. The advanced classes each chose a panel, which in turn chose its chairman and determined which of the suggested topics would be the best "center of interest" for their discussion. (It was interesting to notice that each of the four classes chose a different topic.) The topics were: No Nation Can Stand Alone; Commerce Aids Progress; Would Mankind Have Attained the Present Stage of Civilization Without Commerce? and, Commerce with Other Countries One of the 'Requisites of a World Power.'

These discussions actually had the semblance of conversation, with most of the members eager to participate. Many of the members of the panels had done considerable research in their preparation. Some had found some unusual facts to add to the interest. Sometimes the clash of opinions made the conversation extremely lively. There was splendid attention from the "audience," some of whom participated when given the opportunity. In one audience, a boy had found something which he considered so interesting that he asked the chairman if he might read it, as he could not do it justice if he tried to tell about it. He read:

> The variety of feudal tolls is almost inconceivable. . . . A French scholar made a list of seventeen different kinds of tolls, but this is rough and incomplete. We can say in general that tolls were levied everywhere and on everything. Even a jongleur, the equivalent to the modern organ-grinder, could not pass the gates of Paris without making his monkey show off to pay his own way.

A man had to pay toll not only when he went over a bridge; he had to pay a toll when he went under it, and could not escape the toll by going around it. And,

Charlemagne forbade the compelling of travelers to use bridges when there were short-cuts, or the building of bridges in dry places to extort passage money from travelers.

Following each discussion, a few minutes were devoted to criticism and commendation of the panel. In two of the classes, one of the audience group commented upon the tendency of one member of the panel to "talk too much" and remarked that another member "said nothing," adding that he "guessed she didn't have a chance." Someone else said "the chairman is supposed to see that every one gets at least two chances." Another remarked that "the chairman forgot to summarize the points before asking the audience to take part."

All of which seems to indicate that the bulletin of instructions is useful to members of the panel and to the audience as well.

PANEL DISCUSSION TECHNIQUE

The "panel" discussion is very unlike the formal discussion in which each speaker stands up and talks without interruption for a certain length of time. In fact, a panel discussion is as informal as a conversation. And just as in a conversation, the more the members of the group know about the topic being discussed, the livelier will the conversation be, so it is with the panel discussion.

Worthwhile discussions are possible only when all members of the panel and most of the other pupils in the class have made conscientious and thoro preparation.

PREPARING FOR THE DISCUSSION

1. Read all available information on the subject.
2. As you read, jot down, for later study and thought, items of particular interest and importance.
3. Make a note of questions that occur to you as you read. You may come across information which answers these questions for you or you may be able to think out the answers before the discussion. If these questions are important, they should be brought up in the course of the discussion.
4. Organize the information gathered so that if you were giving a comprehensive speech on the subject, your speech would have *continuity*. (If all members of the panel prepare themselves in this fashion, each member will be able to converse intelligently on the topic being discussed.)
5. Prepare a few notes to serve as a guide to continuity. Each note should be only a word or two as a *reminder* of some point to be stressed. (Note cards about 3 x 5 inches can be held in the hand where you can glance at them unobtrusively.)
6. A word of warning!—No one should give a "prepared" speech on any phase of the subject—it is not done in normal conversation.

7. The audience is expected to take part in the discussion. (See #8 under "General Procedure in a Panel Discussion.") Every member of the class should prepare himself to take a part when given the opportunity.

SELECTING THE MEMBERS OF A PANEL

The ideal number is about seven. As few as five and as many as nine have been successful.

To insure a *worthwhile* discussion the persons selected should have the following qualities.

1. The intelligence to read and follow instructions and suggestions prepared by the teacher (or someone else) who, no doubt, knows more about the matter than the student would be likely to know.
2. The intellectual ability (1) to search for information on the subject to be discussed, (2) to think thru this information and come to some conclusions, (3) to present his ideas for the consideration of the others of the group, and (4) to give due consideration to the views of other members of the panel and of speakers from the audience.
3. The ambition to prepare himself to the best of his ability for his part in the discussion.
4. A feeling of personal responsibility for the success of any project undertaken by any group of which he is a member—in this case keeping the discussion alive without doing too much of the talking himself.

THE CHAIRMAN'S* DUTIES DURING THE DISCUSSION

1. He should *tactfully* check long speeches and those speeches which wander away from the topic. This may be done in various ways. For example:
   a. Call on someone else for an opinion concerning the point under consideration at the time, or
   b. Call attention to the similarity or to the difference of opinions held by the speaker and some previous speaker in regard to some point and then ask what others think of the matter, or
   c. Say that perhaps enough time has been given to the particular point being discussed and that it is well to take up some other phase of the topic.
2. He should see that each member of the panel has *more than one* opportunity to speak.
3. He should summarize the discussion, i.e., repeat the principal points which have been brought out by the members of the panel.
4. Following this summary, he should rise and say to the audience that they may take part in the discussion by asking questions or stating their views. (Persons in the audience must be recognized by the chair before they may take part.)

GENERAL PROCEDURE IN A PANEL DISCUSSION

1. The members of the panel are seated at a table. (On three sides of the table so that the audience can see each member of the panel.)
2. The chairman and all members of the panel *remain seated during the discussion.*
3. The chairman introduces the members of the panel. (The audience is pleased when the chairman stands during this ceremony. They also like to see each member rise to his feet to acknowledge his introduction.)

* The choice of a chairman is particularly important.

4. The chairman reads or states the topic or question to be discussed and declares the panel open.
5. Any member of the panel makes a remark, which serves to start the discussion. (This initial remark may well be explanatory in nature, or it may be a definition of some word in the topic, or it may be a "guide" to start the discussion at an appropriate point.)
6. First one person and then another makes a remark or two, as in any informal conversation. (Keep the semblance of conversation and there will be little danger of any one breaking the *continuity* of thought by wandering off on some widely divergent idea.)
7. There is no order in which the members of the panel speak nor is there any limit as to the number of times each may speak. But, no one person should monopolize the conversation. It should be noted, also, that *long speeches* are *taboo*.
8. The discussion by the "panel" occupies about two-thirds of the time. The audience should have the remainder of the time, altho members of the panel may be drawn into this part of the discussion if the audience so desires.

NOTE. A "panel" in a sense is formal because it follows a carefully planned procedure.

THE TEACHER'S ROLE

It might be well to call attention to some phases of the technique of panel discussions which naturally are not included in the pupil's bulletin. It is desirable that the teacher be a member of the audience, speaking only when necessary even tho it is sometimes difficult to keep quiet. The teacher really plays the most important part as a *source* of reference, being called into the discussion by the chairman when he feels the need to do so.

Before the discussion takes place, the teacher should talk over the time element with the chairman. The length of time to be allotted for a discussion naturally varies with the topic discussed. It should not be too long for sustained interest in the topic.

ESTABLISHING AN INEXPENSIVE WEATHER STATION

THOMAS F. BARTON
State Normal University, Carbondale, Illinois

Weather arouses such a universal interest and curiosity among young and old, rich and poor, and the slow and quick to learn that a weather station should exist for every school. With the trend in teaching methods swinging toward the laboratory and the experimental, is it not surprising that the study of weather thru the use of the weather station should be so sadly neglected? That this method of observing, recording, describing and interpreting weather has been overlooked and unused in the field of physical geography or physical science, is a definite "loop-hole" in our ultimate functional curriculum. Our failure to use the weather station in teaching may be due to the teacher's lack of elementary training on the subject and to the misconception that the establishment of a station is an expensive undertaking. Neither of these factors is an insurmountable barrier since pupils and teachers may cooperatively establish a station and study the weather.

An Inexpensive Weather Station

An inexpensive weather station may contain:

1. A fruit jar and bottle barometer.
2. A school-made wind vane.
3. A mimeographed or typed Beaufort Wind Scale chart.
4. A free cloud chart (and ten-cent booklet if desired).
5. A crock rain and snow gauge.
6. A ten-cent store thermometer.

These inexpensive instruments may be obtained by salvaging otherwise discarded material, with about fifty cents, and by spending a little time and energy. The station when established will enable pupils and teacher to observe, record, describe, interpret and predict the four weather elements of pressure, wind, precipitation and temperature.

Naturally a fruit jar and bottle barometer is not as accurate as a two-hundred fifty dollar mercury barometer such as used by scientists. But from the standpoint of teaching, it may be more useful and is vastly superior to having nothing at all. It will visibly and correctly show pressure changes and indicate weather changes.

1. Barometer. In constructing a jar and bottle barometer, fill a discarded fruit jar half full of water. In a long-necked bottle put

a little water and invert the bottle quickly into the jar as shown in Figure 1. By raising the bottle carefully just enough of the water may be let out so it will stand at B. When a cyclonic storm or a low is approaching, the air in the bottle will be warmed and the pressure or weight on the water in the fruit jar will be lowered. The air in the bottle will push the water in the neck down toward R. When the low passes on and a high is over your station the air in the bottle will be cooled and contract and the weight of the air pressure will be greater on the surface of the water in the jar, therefore, the water in the bottle neck will be forced up toward D. If the water is down to line A in the evening and still lower in the morning look for stormy weather. Every evening a slight lowering is normal. With this instrument and by keen daily observations a boy or girl may learn to predict weather for hours in advance.

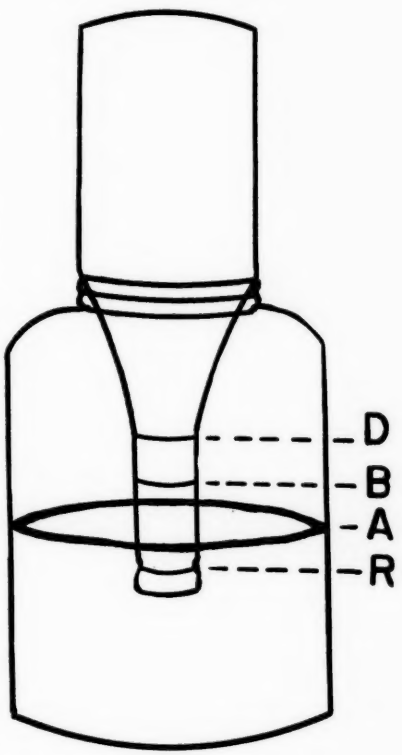


Fig. 1

The water barometer should be used outdoors and in winter may be protected from freezing by the use of prestone.

2. Wind vane. The making of a wind vane may be a class, committee, or individual project. It may be of the arrow or wind-sock type. A piece of otherwise discarded wood about eighteen inches long is all that is needed. The wind vane should be placed where the wind may strike it unobstructed. The wind-sock type of vane may appeal more to children interested in airplanes and aviation.

3. Wind velocity chart. A mimeographed or typed Beaufort Wind Scale chart should be placed somewhere on the wall where the pupils may examine it at their leisure.[1] This chart enables one

[1] Those not acquainted with the Beaufort Wind Scale may find one on page 35 of *A College Workbook in Weather and Climate*, by Douglas C. Ridgley and Clarence E. Koeppe. McKnight and McKnight, Bloomington, Illinois.

to observe objects in landscape such as leaves, smoke, etc., and estimate wind velocity. The scale is scientifically sound and is used by government weather observers if their instrument is disabled.

4. Cloud chart. A letter from the class or teacher addressed to the Weather Bureau, Department of Commerce, Washington, D.C., brings free of charge a chart illustrating the common types of clouds. This chart should be placed where the children may see it and study it at will. If, for junior or high school students, more information is desired, a small booklet entitled "Codes for Cloud Forms and States of the Sky" may be secured from the Superintendent of Documents, Washington, D.C., for fifteen cents.

5. Rain and snow gauge. Altho pressure, wind and cloud changes are more frequent than precipitation, the latter is a very interesting phenomenon. Pupils enjoy measuring the amount of rain or snow fall. An old earthen cylrindrical crock with a mouth measuring ten inches or more makes a good gauge. The gauge should be located as far from an object such as a building or tree as the object is high. Precipitation may be measured by a ruler—preferably one which measures tenths of an inch.

6. Thermometer. It is impossible to make an inexpensive thermometer. However a ten-cent-store thermometer will serve the purpose and an inexpensive one is better than nothing. It isn't the accurate measurement so much as the comparative record that is important.

About one hundred stations of this type were established in southern Illinois during the fall of 1940. Of course, one can spend more money and buy or make better instruments, but the writer has purposely kept the expense low so that no school or pupils need be deprived of the fun and education experienced in studying weather by the laboratory method.

Stations will vary as to means and interest. Those who can may take the United States Daily Weather Map for a few months during the winter and may buy a hygrometer for about six dollars which will measure relative humidity and dew point. Others will construct a weather shelter for their thermometer and may buy maximum and minimum thermometers. Some may construct a sun dial and make an inexpensive hygrometer. Or students may show yearly distribution of precipitation at their station by using twelve test tubes and a rack. A little coloring to the water placed in the

tube in proportion to monthly precipitation will make the curve more conspicuous. Some may purchase "Instructions for Cooperative Observers" from the Superintendent of Documents, Washington, D.C. for ten cents. Still others will buy a science reader, such as *The World's Moods* (*The Story of the Weather*) by Maryanna Heile from the Follett Publishing Company, Chicago, Illinois or *Rain or Sunshine* (*The Story of the Weather*) by Mariam Baer from Farrar and Rinehart, New York.

A fitting climax to the completed station might be a field trip to some nearby government weather station or co-operative state station.[2]

KEEPING THE WEATHER RECORD

The weather record may be kept by pupils of any level from primary to senior high. Methods will vary according to levels. Let us consider the primary level.[3] A large calendar may be secured containing large squares with only the figures in each leaving available white space on which to write. The children can place the daily temperature in figures after a capital T, thus, T=60°. Wind velocity may be shown in a similar manner, WV=10 miles and wind direction WD=W. Other letters may be used for types of precipitation such as R=½ inch for rain, S=2 inches for snow, D for dew and F for frost. Pressure may be indicated by the words falling, rising or steady. Cloud symbols may be used as shown in Figure 2.

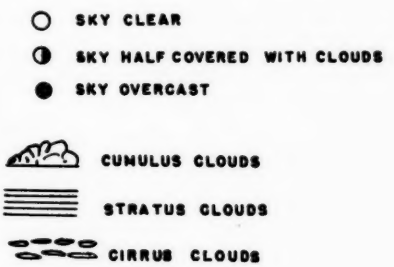


FIGURE 2.

These symbols are not theoretical but they have been used by a second-grade teacher. The words were not spelled out on the calendar; only the symbols were used. More mature pupils will use more elaborate methods of recording weather. They may make temperature and precipitation curve or bar graphs. Wind roses will generate interest at school and at home.

[2] You may find the location of your nearest station by writing to the head of the Weather Bureau of your state.

[3] The weather station enables the teacher to use several of the teaching methods suggested by Thomas F. Barton in "Primary Geography," JOURNAL OF GEOGRAPHY, Vol. 39, 1941, pp. 243-246.

CORRELATION

The weather station is not only a stimulating device in the study of weather as a part of physical geography, but it also contributes to other subject matter fields. Reading the thermometer, measuring the precipitation, and estimating wind velocity involves the functional use of numbers. The continuous drama of weather offers excellent opportunities for oral and written expression. Food, shelter and play activities may be considered in light of daily and weather conditions. Many children are eager to draw a weather instrument, a rainy day, a snow storm or some picture with a weather theme. The use of symbols by the pupils' aids is the approach to map reading.

A FOURTH GRADE FIELD TRIP

Last year soon after the establishment of a United States Airway Weather Station on our campus under the sponsorship of the Geography Department, the writer received a letter from the fourth grade of the Allyn School.[4] The pupils expressed their desire to visit our weather station. It was a most inspiring experience. Together we observed the clouds moving in different directions. They recognized, unaided, the different directions. They were interested in the rain gauge, the wind anemometer and the maximum and minimum thermometer. Their questions were excellent, spontaneous. They verified the writer's belief that children are curious about the weather and are capable of understanding it if taught to them in a language they can understand.

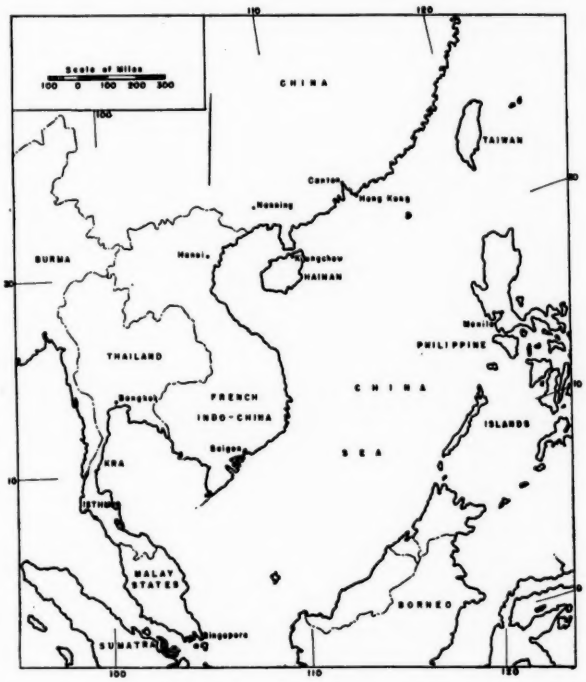
[4] The fourth grade class was under the supervision of Mrs. Ruth Fults and cadet teachers.

HAINAN: STEPPING STONE OF JAPANESE IMPERIALISM

ALFRED W. BOOTH
University of Illinois

Hainan, that little-known island just south of China, has been on the news front for the last few years, but never so frequently as it is today. All of this publicity is due to one fact: Hainan is one of the significant stepping stones in the Japanese imperialistic march to the south.

In seizing the island over three years ago, the Japanese probably had two objectives in mind. The principal and more immediate objective was to use it as a base in their campaign of creeping aggression. The second and more long-range objective was to exploit it commercially, since Hainan's tropical products would serve to overcome certain Nipponese raw material deficiencies.



Hainan, which had been part of China for over 1800 years, has an area of approximately 14,000 square miles and a population of over two and one-half million. A large percentage of its population is the non-Chinese Lois, many of whom were never entirely subjugated by the Chinese. Most of the island is a tangle of jungle-covered hills and mountains, with patches of flat arable land found here and there in the river valleys and along the narrow coastal plain. The coastline, tho irregular, has no particularly suitable harbors for modern ships, since offshore waters are very shallow. Even at the principal port, Hoikow (near the capital Kiungchow), boats must anchor two miles off shore.

Despite this handicap of poor anchorage facilities, the Japanese were eager to take the island, since it is only fifteen miles away from the southern coast of China, and so provides an excellent base from which to operate a blockading fleet. This was the immediate purpose of its seizure. At the same time, the grab of the island put the Japanese athwart the British supply line from Singapore to Hong Kong and consequently, considerably reduced the potency of this last-named base.

Having taken Hainan, the Japanese established fleet, airplane, and army bases, and were then ready to utilize its strategic position as a center for further military and naval movements. At the time that Hainan was seized, the Chinese were receiving important military supplies over the railroad from Hanoi, in northern French Indo-China, to Nanning, in China. Both of these cities were now only about 200 miles from Japanese air bases and so within striking distance. The first phase of the campaign to close this significant railroad consisted of bombing attacks. When these proved ineffectual, Hainan became one of the bases for the Japanese army, which eventually captured Nanning and pressed down to the northern border of French Indo-China.

This surge to the Indo-Chinese border inaugurated the phase of Japanese aggression which is still in progress, the movement toward Singapore, the key to the wealthy East Indies. From a glance at the map, it can be seen that after the occupation of Nanning, northern French Indo-China could be attacked from both the north and south, from Nanning and Hainan. This double threat made the French position more or less untenable, and accounts for their readiness to accede to Japanese demands upon them. Thus the western flank of the threatened Japanese southern movement is now protected.

A new purpose for the seizure of Hainan now appears. The nearest part of the Japanese Empire Proper to Malaysia is the island of Taiwan (Formosa), 2000 miles northeast of Singapore. Obviously Taiwan is too far away from the projected scene of action to operate as the main Japanese source of supplies. For this reason, Hainan will continue to function as a Japanese stepping-stone. To illustrate, from Taiwan to Hainan is 600 miles, from Hainan to Saigon is 600 miles, and from Saigon to the Isthmus of Kra, which the Japanese must control if they contemplate land action against Singapore, is another 600 miles by water. Incidentally, it might be noted that it is about 600 miles from either the Isthmus of Kra or Saigon to Singapore.

Of possible concern to the United States is the position of Hainan with respect to Manila, the chief military base of the Philippine Islands. Or reversing the statement, of possible concern to the Japanese is the position of Manila on the eastern flank of their line of southern expansion. From Manila to Hainan it is about 700 miles, a distance which could be covered by a fast plane in about three hours. At present one can only speculate whether the Japanese will continue their southward movement without disposing of this threat to their flank, either by diplomatic or militaristic means.

The second aspect of the Japanese occupation of Hainan is associated with the potentialities of that island for commercial exploitation. One of the great requirements of the Japanese economy has been the free flow of tropical foods and industrial raw materials to Japan. In fact, this need has been the basic motivation in their present attempt to include the East Indies within their sphere of influence. Under Chinese rule the island was only exploited superficially and such curious articles of commerce as snakeskins, antlers, and dried monkeys, to be used for the compounding of Chinese medicines, were the chief exports. The 2,500,000 Chinese and tame Lois of the island carry on a self-sufficient type of tropical agriculture, raising very little beyond their ordinary needs for trade with the rest of the world.

The chief crop is rice, most of which is raised on the flat alluvial lands on the edges of the island. How much more could be produced if all suitable land in the interior were turned toward its production is unknown. However, the tropical climate of the island, with its abundant rainfall and all-year-round growing season, would suggest that enough rice could be produced so that a surplus for exportation would be available. Other tropical crops which could be produced in exportable quantities are sugar, coconuts, and various tropical fruits.

Most of the island is cloaked with extensive tropical forests which contain valuable hardwood trees such as mahogany and rosewood. There has been very little lumbering carried on in the past, however. Various minerals are known to exist. These include tin, gold, silver, copper, lead, iron, and even coal. Mineral exploration has not been carried on very intensively so that little is known as to the extent of deposits of these minerals.

If the Japanese intend to exploit Hainan, they are faced with three tasks. The first is the complete exploration of the island so that its potentialities can be inventoried. The second is the sup-

pression of the debilitant tropical diseases which run rampant on the island. The third, and perhaps most difficult, is to bring the inhabitants into accord with the Japanese economic system. However, there is no doubt that before these tasks are started, the Japanese must dispose of the more immediate problem which they have created in southeastern Asia.

STAMPS: THE HOBBY OF KIDS AND KINGS

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Sometimes a little stimulus is all that is needed to create in students a genuine interest in geography. The problem of how to assist them may easily be solved by philately, for there are many ways of using stamps to portray the various geographical factors. One such way would involve making a series of six world maps of the climatic zones*: (1) Rainy Tropical, (2) Arid Tropical, (3) Monsoon Tropical and Semi-Arid Tropical, (4) Mediterranean, Dry, and Humid Subtropical, (5) Temperate Marine, Dry and Humid Continental, (6) Polar Continental. The climatic zone represented on each map would then be colored to distinguish it from the rest of the world. Next would be stamps illustrating the vegetation or native wild life from each country lying in that particular zone arranged around the map, as tho they were the frame of a picture.

Let us take as an example the Monsoon and Semi-Arid Tropical map. Each zone is shown in a different color. Surrounding the continents is a frame of stamps: along the sides and bottom the Monsoon climate is represented, along the top the Semi-Arid. It is very easy to get stamps which show geographic relationships in the Monsoon areas. For example: The quetzal appears on several Guatemala stamps, a sugar cane field on the 10 centavos Cuban stamp of 1905, a native woman making cassava on the 1919 issue from Jamaica, a native tapping rubber on a Mozambique stamp. The list is almost endless. Similarly, representing the Semi-Arid zone is a lion on the Kenya, Uganda, and Tanganyika 1935 issue, a giraffe on the 1901 Nyassa issue, and a rhinoceros on the last Ethiopian set issued before the Italian occupation.

*The author used the classification of White and Renner in Geography, an Introduction to Human Ecology (D. Appleton-Century Company, Inc., New York, 1936, p. 31). The classifications of other geographers would be just as suitable.)

There are other possibilities, too. A series of maps of the six continents could be prepared with the countries marked and outlined. Then stamps which are most representative of the character of the countries considered could frame the maps. Another alternative would be a study of the native wild animal life of the world. Similarly, studies in stamps of the vegetation, agriculture, industry and commerce, physiography, and the various races of the world would increase knowledge as well as interest.

The value of using stamps is greater than it appears at first glance. The first important result would be increased interest on the part of the students, especially those who are already stamp collectors. The stamp collectors would have a keen interest to begin with, and they would only have to direct it into a new channel—that of making their hobby a means to an end and not an end in itself. Some students might become sufficiently interested to take up the hobby. One of the chief recommendations for philately is the way it stimulates curiosity and the power of observation. There is a story behind every stamp and the true philatelist wants to know every story.

The second value to be derived goes hand in hand with the first, for it is the emphasis on and the review of geographical factors which such a project naturally entails. These geographical factors would include such things as climate, geographical location, physiography, agriculture, industry and commerce, vegetation, native animal life, and the human races. Working on a project such as this would necessitate careful study of all these factors in relation to each of the countries considered, and constant review to keep all the points in mind. Stamps are very useful in helping the student to associate the correct geographical factors with each country. For example: The mountainous terrain of the Grand Duchy of Luxembourg and of Andorra is almost the sole theme of the stamps from those countries. The camels and sandy deserts of Algeria, Libya, Egypt, Eritrea, and the Sudan make very attractive subjects for the postal issues of those countries. These stamps illustrate the combination of factors which makes the countries what they are. Stamps used in this way are an excellent application of the psychological principle of the value of association in the process of remembering.

Philately has indirect values, too. These projects make beautiful exhibits of which the whole class will be proud. Exhibits are really an integral part of our educational system. Stamp-collecting

would also teach students to either begin or continue a useful hobby. It is recognized fact that everyone should have a hobby, whether it be buttons, fossils, scrapbooks, or stamps. And the time to develop the hobby habit is in school.

It is surprising how much little scraps of paper can teach in the way of responsibility and careful handling. The responsibility of doing something worthwhile with a definite objective and a definite time-limit in mind is a good thing to develop at an early age. Likewise, learning to handle carefully the little pieces of paper often helps to quiet restless would-be Lone-Rangers. It takes a fascinating hobby like stamp-collecting to absorb their interest and curiosity for more than ten minutes. One mother even thanks stamp-collecting for teaching her ten-year-old son to wash his hands. Clean hands had been the basis of daily family arguments. The boy became interested in stamps, then discovered that dirty smudges detract from their beauty and worth, and immediately acquired a penchant for washing his hands at the slightest provocation. Of, course, philately is not guaranteed to accomplish such wonders with every student.

There is a limitation to this method of using stamps to teach geography. Some teachers and students lack any interest whatsoever in philately. In those cases such a method would be useless, because it would be contrary to the whole idea of learning while you play. Disinterested teachers would not make the idea sufficiently attractive to the pupils.

A second possible limitation in some minds might be the matter of expense. But that is another recommendation for the whole idea. A very commendable job can be done using stamps which catalogue from one to five cents each and which sell at net price (half the catalogue value) at reputable stamp dealers. When you think of all the money wasted by many students on cheap candy, the cost of such a project is very small indeed. Stamp-collecting is a real investment which pays dividends first in pleasure and knowledge and secondly in actual money, if the collectors are conscientious about their hobby.

The educational value of such a program is a philatelic axiom. The record of philately speaks for itself, for the hobby has had the support in the past of George V of England, Franklin Delano Roosevelt, Ellis Parker Butler, and other famous men. Stamp-collecting is truly the "hobby of kids and kings." The "kings" have spoken, now let the "kids."

EDITORIAL NOTES AND NEWS

A. H. MEYER, Department of Geography and Geology, Valparaiso University, chairman of the Committee on Standards of Certification for the Teaching of Geography in High School, announces the committee's personnel as follows: L. C. Davis, Department of Geography, State Teachers College, Indiana, Pa.; John R. Emens, Chairman of Personnel Committee, Board of Education, Detroit, Mich.; Preston E. James, Department of Geography, University of Michigan, Ann Arbor, Mich.; Edwin H. Reeder, College of Education, University of Illinois, Urbana, Ill.; George T. Renner, Department of Geography, Teachers College, Columbia University, New York, N.Y.; Howard E. Wilson, Graduate School of Education, Harvard University, Cambridge, Mass.

The functions of this committee are to gather facts on the high school teaching requirements of each state, and to recommend to the Executive Committee of the National Council of Geography Teachers adequate standards of training in geography comparable to that of other high school fields of learning, and to suggest ways and means of securing the adoption by the states of such standards as may be approved by the Executive Committee.

The United States Bureau of Animal Industry and the Virginia Agricultural Experiment Station, following a three-year study, report that if grass-fed cattle are as fat as grain-fed cattle, the two types of beef after ripening are practically identical in flavor and in quantity of juice.

Alabama is the first of the states to have every acre of farm land in a soil-conservation district.

When the New York State Geographical Association convenes at Brockport State Normal, Brockport, New York, on October 11, a field trip will be conducted by Anthony J. West of the local Normal, from 2:00 to 5:00 P.M. Attention will be directed to "The Development of Present Land Utilization of the area from the point of view of Historical Geography." A symposium on the trip follows the dinner. Those wishing to present papers at the morning session dealing with the geography of the state are requested to contact M. Melvina Svec, State Teachers College, Buffalo, New York.

THOMAS W. CHAMBERLIN, Chairman of the Geography Section of the Tennessee Education Association, reports a well-attended meeting held last spring at which a panel discussion on the teaching of geography as it is related to education and national defense was led by R. L. Martin of George Peabody College. The out-of-the-state speaker was Dr. Carl Stotz of the University of Pittsburgh who talked on Turkey. Dr. Whitaker of George Peabody College was elected president.

More than two hundred persons interested in geography and its allied subjects attended the meetings of the New England Geographic Conference which met in May at the State Teachers College, Worcester, Mass. The title of Dr. Huntington's presidential address was "Next Steps in Geography." At the evening session, Dr. J. Russell Smith discussed "How long will the United States last?" Other papers dealt with New England,

Latin America, and the teaching of geography, with a demonstration lesson on the use of sound films. Dr. Van Valkenburg is the next president.

The Information Service of the Department of the Interior reports that the installed capacity of water wheels in the United States totaled 19,000,000 horsepower in 1940. The next ranking nation is Canada with 8,584,000 horsepower. Italy has third place with 6,250,000.

It is reported that the work of cutting the world's largest diamond was begun in New York this spring, after months of study as to the best way of cleaving it. This flawless diamond of 726.6 carats, the Presidente Vargas by name, was valued at a million dollars. Only two other larger diamonds have been found, the Cullinan of 3,106 carats and the Excelsior of 995.5 carats. The Vargas was found in Brazil in 1938.

The Census Bureau reports that 3,022,387 square miles is the correct area of the United States.

The February issue of *News Letter,* Bureau of Educational Research, Ohio State University, features an annotated bibliography listing sources of inexpensive teaching aids.

The United States Office of Education recently announced a collection of twelve bulletins containing teaching aids and suggestions to promote conservation education and practice in both rural and city communities. Four of the bulletins are free and may be secured from the Office of Education. The others have a nominal cost and are available from the Superintendent of Documents.

According to present plans, the next annual meeting of the National Council of Geography Teachers will be held in New York City, December 31-January 2. The Association of American Geographers will also meet there.

In a recent Geography News Letter sponsored by Lambda chapter of Gamma Theta Upsilon, Southern Illinois State Normal University, is a brief account of a geography sponsored woodlot on the University farm. The area selected by Dr. Barton was a badly eroded area on which 5,000 young pine trees were planted by N.Y.A. labor.

More than sixty millions of banana bunches were shipped into the United States in the peak year, 1937. Sixty per cent of them came from Mexico, Honduras, and Guatemala, with New Orleans as their chief port of entry and New York, second ranking port. They outrank in value all our other fruit imports.

GEOGRAPHICAL PUBLICATIONS

The Foreign Trade of Latin America. United States Tariff Commission, Washington, D.C. 1940.

"This report examines, for the decade 1929-38, the trade of the 20 Latin American countries with the world and with the United States. It is divided into three parts; Part I deals with the trade of Latin America as a whole, Part II with the trade of individual Latin American countries, and Part III with Latin American export commodities. Part I contains a short description of the Latin American area, a consideration of the commercial policies of the Latin American countries, an examination of the total trade of Latin America with the world and with the United States, and an analysis of special problems in the foreign trade of Latin America. Part II, consisting of 20 sections, is a survey of the commercial policy and the foreign trade of each of the 20 Latin American republics, with special emphasis on the trend, composition, and destination of exports, and the trend, composition, and sources of imports. In addition, each section contains an analysis of the trade of the United States with the particular country. Part III deals individually with approximately 30 selected Latin American export commodities, for each of which there is a discussion of production, exports, trade barriers, competitive conditions, and the effects of the European war."

Every teacher of Latin America and every student interested in the problems of Western Hemisphere solidarity will find the various parts of this excellent report of inestimable value.

Ellsworth Huntington assisted by Frank E. Williams, Samuel Van Valkenburg, Stephen S. Visher. **Principles of Economic Geography.** 715 pages, approximately 280 black and white maps, graphs, and charts. John Wiley and Sons, New York, 1941.

L. Dudley Stamp. **An Introduction to Commercial Geography.** 247 pages, 170 illustrations, 56 black and white maps and graphs.

Huntington rides again! He rides his hobby of climate and man thru some seven hundred pages of text, and with his galaxy of assisting stars produces a document which has some of the redundancy and produces some of the satiety of a double feature.

This double feature effect is enhanced by the seeming attempt to produce a book on principles and a book on regions at the same time. It is divided into twelve parts: The Scope of Geography; The Vegetational Factor; The Soil and Its Use; Problems of Relief and Erosion; The Geography of High Productivity; Economic Geography of Animals; The Human Factor; Food and Diet; Regions of High Productivity; The Mineral Factor; Manufacturing; Cities and Commerce. Principles are presented and elucidated thruout the book and this job is well done, but it seemingly interferes at times with the logical sequence of the book's development.

There are no photographic illustrations but numerous stimulating grafs expertly conceived and used to illustrate the author's points. The lack of an index to maps and grafs and the use of paragraph rather than page references to maps and grafs makes it difficult to refer to them.

We can thank Huntington for a world map of soils in such a book. A somewhat over-generalized map of "Natural Regions" is based, according to the authors, on "Climate and Human Use."

There is much that is new, stimulating, and provocative in this book. Doubtless no

teacher of Economic Geography would fail at least to cite it. Perhaps it would be difficult to use as a text.

Dudley Stamp, in his book, has done precisely what he says in his introduction he wishes to do. It "seeks to examine the chief products of the earth and its surface valued by man, to show where and how they are produced and how they are shared among the nations or exchanged between them. It may thus hope to show, incidentally, how no modern civilization can hope to exist in the fullest sense without international trade, which in turn depends upon mutual trust and understanding."

"So many of the commodities of commerce are known in temperate lands only in their final form, that an attempt has been made to illustrate this book with pictures that tell the earlier part of their story."

Aided by some 170 illustrations excellently chosen and strategically arranged, and a lucid style, he does these things excellently. This book should be the invaluable companion to all beginning students in Economic and Commercial Geography.

L. C. DAVIS

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Richard Upjohn Light. **Focus on Africa.** 228 pp. Illustrations, Maps, Bibliography. American Geographical Society (Special Publication 25). N.Y. 1941.

Focus on Africa is mainly the record of a well-planned flight from Cape Town to Cairo and thence to Tunis and Corsica in the winters of 1937 and 1938. The three hundred or more excellent views, mainly aerial photographs, were taken by Mrs. Light; the textual matter was prepared by Doctor Light who "followed substantially the plan which guided our journey: to pursue that which is interesting, timely and of special association with the locality under discussion."

The author, who demonstrates that he is a geographer as well as a physician, has familiarized himself with literary sources and is thus enabled to support the narrative with penetrating and far-reaching observations. The chapter on Tanganyika, for example, is mainly a personal record of the flight, but closes with a discussion of tsetse-fly and soil erosion problems. Each chapter is accompanied by a flight map, leaving no one in doubt as to where the Lights went and touched ground. In the final chapter, "The Scope of Aircraft in Africa," the author reviews the development of aviation, evaluates the present advantages and handicaps, and peers cautiously into the future.

Thruout the book, serious commentary is interspersed with day-by-day incidents and amusing anecdotes, and high adventure is met with in the most casual terms. The account of the flights to the Ruwenzori, the encounter with the lions in the Serengati Plains, the long sweep down the Nile—these and other episodes are rendered the more thrilling by the plain way in which the tale is told. Typical are the concluding lines of the narrative which state simply that "at Marseilles, when the machine was being transferred by a deck crane, the wind, still 60 miles an hour, crashed one of the wings into the superstructure." One should not miss this new and instructive African adventure.

RALPH H. BROWN

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